the adoption of the eternal, monotonous, uninteresting architrave saves both: that the slight thickness of our modern walls prevents the attainment of effect without architraves, is at once disproved by a reference to the admirable old domestic architecture at Bruges and other cities in Belgium, where the depth of reveal of the windows is often not more than 4½ inches. As to the definition of "breadth," I am inclined rather to take the explanation suggested by the scope of the paper than that given by Q. E. D.; namely, "the comparative infrequency and smallness of the apertures in a façade," since I imagine that that desirable quality may even be secured by their very frequency and size, or by means of their connection with the wall surface by similar ornament, as in most of the later Gothic structures.

J. P. S.

THE THEORY OF THE TIDES.

OBSERVING in your last number but one some observations on the tides, signed "W. Adolph," pointing out certain anomalies of the present theory of the tides, and arguing therefrom that that theory is not true, I beg leave to offer the following remarks, which will show your correspondent that the objections which he has stated do not exist in fact, and that, however inadequate our present means may be to predicate the actual time and rise of high water in any locality, there does not admit of the shadow of a doubt as to the truth of the present explanation of the tides.

Your correspondent, on the authority of Mr. Kerigan, states that calculations founded on the principles of universal gravitation, show that the moon would not be retained in her orbit by the mere force of terrestrial attraction; and as it is desirable to correct this fundamental error before proceeding further, I shall give briefly the calculations by which it is demonstrated that the moon is retained in her orbit by the earth's attractive force alone.

Let g = the space in feet fallen through by a body under the influence of gravity in one second, at the earth's surface; s = the space in feet similarly fallen through at the distance of the moon; r_1 = 3,957 miles = the mean radius of the earth; r_2 = 237,894 miles = the mean radius of the moon's orbit; t = 2,360,592 seconds = the time of a sidereal revolution of the moon; p = 3·14159; then by the laws of gravitation the space fallen through varies as the attractive force, and both inversely as the square of the distance. Therefore,

$$s : g :: r_1^2 : r_2^2$$

and

$$g = \frac{s r_2^2}{r_1^2}.$$

Again, the circumference of the moon's orbit equals $2r_2 p$; therefore, the space moved over in a second equals $\frac{2pr_2}{t}$; and since, in a very small arc, the diameter of the circle is to the length of the arc, as the arc is to its versed sine, or by the space fallen through by the moon in a second, we have

$$2r_2 : \frac{2pr_2}{t} :: \frac{2pr_2}{t} : s$$

and

$$s = \frac{2^2 p^2 r_2}{t^2};$$

and substituting this value of s in the former equation, we have

$$g = \frac{2^2 p^2 r_2^2}{t^2 r_1^2}.$$

Substituting the values of the various quantities, and performing the calculation—

Logarithm of 2 =	....	·3010300
Log. p^2 =	.....	·9942997
Log. r_2^2 =	.....	16·1291505
		17·4244802
Log. t^2 =	12·7460420	
Log. r_1^2 =	7·1947322	19·9407742
		3·4837060
Log. 5280 (no. of ft. in a mile) =		3·7226339
Log. of 16·082 =		1·2063399

We thus see that the calculation gives 16·082 feet, the same, within an extremely small fraction, as the value derived by direct experiment, which gives 16·0954 feet.

Your correspondent further appears to be under the misapprehension that the attraction of the earth and moon is not mutual, whereas it may be shown that, whatever may be the cause of the phenomena of attraction between the two bodies, the effect must always, and under all circumstances, be mutual and reciprocal.

And again, he appears to suppose that the atmosphere influences the phenomena of the tides; that the pressure of the atmosphere tends to prevent the rise of the tide, and has to be overcome when it actually does rise; and further, "that, according to the theory of the tides, the moon would draw up the entire sea, if the air was not between." Now, the fact is, that the atmosphere no more opposes the rise of the tide than it does the rise of one of the scales of a balance; and for the same reason, namely, that the atmosphere presses equally over the whole surface of the ocean, as it does on *both* of the scales of the balance; and that one part of the ocean can no more rise without some other part sinking, than one scale can rise without the other falling; and, therefore, that the work performed by the ocean in rising against the atmospheric pressure, is precisely equal to the force imparted by that pressure on the portion which is sinking.

Your correspondent inquires, how is it that the time of the moon's passing the meridian precedes the time of high water? and, further, what is the reason why such small tides are observed in the Mediterranean and some smaller inland lakes? Now it must be remembered that the phenomena of the tides are the result of water thrown into *motion* by an external force ever varying both in direction and amount, not of water in a *quiescent* state, under the permanent influence of a uniform and constant force; and they must therefore be investigated by the laws of dynamics, and not those of statics. This fact is sufficient to explain at once the whole of the anomalies to which your correspondent refers: the tidal wave does not arrive at any given spot so soon as the moon because of the obstacles which have to be overcome in its passage, and it rises to a greater height in some localities than others, because of the greater or less, the more sudden or gradual, resistance which the shores of the ocean offer. Again, in the case of the Mediterranean and other inland seas, the water does not rise under the attractive influence of the moon, because there is no means of supply, whence the enormous body of water requisite to produce any appreciable rise in the sea, could be derived in so short a space of time as the duration of the flow of the tide; and the sea itself is so small that the moon acts with nearly equal force over its whole surface, any small rise of the tide which is actually observable being due to such inequality in the moon's attractive force upon different portions of the inland sea itself.

I will not trespass longer upon your valuable space, but at some future period may, with your kind permission, offer a few remarks in explanation of some of the tidal phenomena, the study of which is so important a branch of hydraulic engineering, and therefore worthy of a place in your journal, which I believe to be as extensively consulted by the engineer as by the architect.

LEX.

ROYAL PRINCESS'S THEATRE.—The scene of Mr. Lovell's new play, "The Trial of Love," is laid in Newark, during the siege by the Parliamentary troops in 1644, and admits of several architectural views, of which the artists have taken very satisfactory advantage. An Elizabethan room, with a carved chimney-piece, and the closing scene—a Gothic hall, with screen and canopy-work—may be particularly mentioned. We do not rank the play quite so highly as some of our contemporaries, but it is, nevertheless, an excellent production, and will afford legitimate enjoyment to all play-goers. It is admirably played by Mr. and Mrs. Charles Kean, Mr. Meadows, and Miss Marshall.

THE CONSTRUCTION OF PORTLAND BREAKWATER.

THERE is no doubt but that this great work is one displaying in high degree the perfection which scientific and practical engineering has now attained, and one which reflects credit on those employed upon it. But in these times, when everything has to be brought to the test of £. s. d. we must take another view of the subject; and since the nation has to pay for it, we must see if the same result could not be obtained by a few hundred thousands less expenditure.

The creation of harbours of refuge is a praiseworthy object in every respect, and we could scarcely have too many; but unfortunately, owing to the costliness of the mode of construction adopted, they must inevitably be few and far between. In opposing a barrier to the fury of the ocean, we cannot do better than take Nature's own works for our model: that is to say, when we wish to construct such a barrier, it will be quite sufficient to throw down a line of rocks in the required direction, each rock so thrown down being alone of sufficient weight and magnitude to resist the utmost force of the waves. It is evident that if we entirely leave out the filling up with small stone or rubble work, which is of no use whatever, except perhaps for injury, in offering a solid mass for the sea to break against, we shall have a breakwater containing less than half the cubic contents of solid stone, consequently costing less than half, and, under the peculiar circumstances of an unlimited supply of waste stone or roach, as it is locally called, close at hand, and of any dimensions, not much more than one-fourth of the ultimate cost of the breakwater now constructing at Portland.

It will be said, however, that such an open-work breakwater, though producing smooth water inside, cannot be made available as a landing pier, and certainly we ought to combine these two objects together for the sake of economy. No; that is the fundamental error. It will be far cheaper to construct an independent landing pier within and under the lee of the outer breakwater, if such convenience should be required: besides, it will be quite sufficient to lay down the breakwater at the national expense: private enterprise will do all the rest.

This is no new idea I am throwing out, for all persons conversant with the Mediterranean are well acquainted with the numerous breakwaters constructed centuries since for the protection of the ports and harbours of these shores. They are called by the Italians by the significant name of "*Scogliera*," in English "*rock-work*," and are formed entirely of huge blocks, roughly squared, varying from 20 to 30 tons each, without any filling up whatever. They have merely been pitched down upon and between each other until the mass has risen above the highest water-mark. All the quays, piers, and landings have been universally constructed in the smooth water under the lee of these Cyclopean rock-works.

Unfortunately in England there is so much capital to be employed, that engineering plans that do not cost out much work for the contractors are liable to be shelved; for the contractors of the present day are big men, and have much influence they are Members of Parliament, and have many friends in and out of the House; so that engineers are shackled and hampered in forming their plans, and cannot reduce them to their utmost simplicity, but, on the contrary, are compelled by circumstances over which they have no control, to introduce as much contractor's work as possible, and the nation, or, as the case may be, the shareholders, have to pay for it.

HENRY W. REVELEY, C.E.

FALL OF A BUILDING IN FRANCE.—It was lately observed that one of the principal walls of the hotel, the Lion d'Or, at Condome, threatened to give way, and an architect was called in to examine it. While inspecting it a violent cracking was heard, and all at once the house fell in. By chance, every person residing in it was out at the time.